DOCUMENT RESUME

ED 255 343 RC 015 218

AUTHOR McNamara, Kevin T.; And Others
TITLE Education as an Investment in Human Capital and Manufacturing Employment Growth.
INSTITUTION Virginia Polytechnic Inst. and State Univ., Blacksburg.
PUB DATE Feb 84
NOTE 25p.; Paper presented at the Annual Meeting of the Southern Agricultural Economics Association (Nashville, TN, February, 1984).
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Economic Development; Economic Factors; Educational Economics; Employment Opportunities; *Employment Potential; *Human Capital; *Manufacturing Industry; Models; *Public Education; *Role of Education; Rural Areas
IDENTIFIERS *Economic Growth; Virginia

ABSTRACT

Recent studies of rural manufacturing employment have presented conflicting evidence about the relationship between human capital and local economic development at a time when competing claims for local investment funds could potentially undermine support for public education. The purpose of this paper is to: (1) develop the conceptual linkage between public education as a local investment in human capital and local economic growth; (2) critique the body of research that has attempted to link changes in manufacturing employment with local education investments; and (3) present new research findings that help clarify the nature of this important conceptual linkage. Measures for the stock and flow of human capital are developed, followed by estimation of a Virginia industrial location model designed to test hypotheses about education's role in manufacturing employment growth. Although the model's results are mixed, this is not seen as a contradiction of the importance of human capital stock and flow. It is suggested that future research give more attention to establishing the proper conceptual framework linking local investments in schooling and other forms of increasing labor quality with different patterns of economic development. (BRR)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

Education As An Investment in Human Capital And Manufacturing Employment Growth

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☑ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Kevin J. McNamara

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

SP-84-4 February 1984

Education As An Investment in Human Capital And Manufacturing Employment Growth

Kevin T. McNamara, Warren P. Kriesel

and Brady J. Deaton

*Research Assistant, Department of Agricultural Economics, Virginia Polytechnic Institute and State University and Extension Specialist, CRD, Virginia State University; Research Associate, Department of Agricultural Economics, University of Kentucky; and Professor, Department of Agricultural Economics, Virginia Polytechnic Institute and State University, Blacksburg, Virginia, 24061. This paper was presented at the Southern Agricultural Economics Association annual meeting, Nashville, Tenn., February, 1984.

Education As An Investment in Human Capital

And Manufacturing Employment Growth

Introduction and Purpose

Recent studies of rural manufacturing employment have presented conflicting evidence about the relationship between human capital and local economic development. While insight into this relationship holds important education policy implications for all levels of government, it is particularly critical for local governments. The largest investment in human capital is represented by primary and secondary education which absorbs over half of most local government budgets, and accounts for 60 to 70 percent of local government expenditures for most Virginia counties.

As more responsibility for economic development is assumed by local governments, it appears that competing claims for local investment funds could potentially undermine the support for public education, though state and federal mandates might prevent this from occuring. The outcome of this competition will depend partly on the perception of the contribution that public education makes to local economic growth. Attempts to scientifically establish this connection, however, are fraught with methodological and operational difficulties. Hence, the issue merits the concern of economists from both conceptual and practical standpoints.

The purpose of this paper is: a) to develop the conceptual linkage between public education as a local investment in human capital and local economic growth, b) to critique the body of research that has attempted to link changes in manufacturing employment with local education investments, and c) to present new research findings that help clarify the nature of this important conceptual linkage. The first section of the paper will develop the link between education as an investment in human capital and economic growth. The second section will review human capital variables used in previous studies of industrial location and manufacturing employment change. Measures for the stock and flow of human capital will then be developed, followed by estimation of a Virginia industrial location model to test hypotheses about education's role in manufacturing employment growth.

Section 1: Education As An Investment in Human Capital

Schultz's seminal article on human capital theory set forth the central postulate: that people act to improve themselves, not for immediate consumption, but with the expectation of a future gain, and such improvement amounts to investment capital. Five categories of human investment activities were posited: (1) health facilities and services, (2) on-the-job-training, (3) formal education, (4) adult study programs, and (5) migration to changing job prospects. Applications of the human capital theory have not distinguished between the important concepts of the stock and flow concepts of human capital.

While all five human capital investments discussed by Schultz are made throughout one's lifetime, the first twenty years of life in the United States are generally devoted to human capital development through public schooling, a public service that is usually the primary responsibility of the local community. An analysis of the local school system therefore provides insight into the community's on-going commitment to human capital development, and measures of local educational attainment allow distinctions to be made between the quality of human capital among labor pools in different communities.

A great deal of the human capital research program has centered on the demand for education by individuals (Blaug). Several studies (e.g. Becker; Link and Ratledge) have estimated the returns to the individual for investment in education. Far less attention has been given to the estimation of social returns to education. Poston discussed the theory of spillover effects from education. Hines, Tweeten and Redfern estimated the social returns for all race-sex groups at all schooling levels to be 11.8 percent. Holtmann found that communities tend not to produce education for which they will not be reimbursed through future economic growth. One important contribution of this body of thought is that it provides a criterion for public investment in education, i.e. that resources be allocated to schooling so that social yields on educational investments are equalized for all levels of education.

The reaction of firms to alternative communities of differently educated people is predicted by standard neoclassical theory, i.e. firms

will estimate the MVP of local labor to the firm and locate where their profits are greatest. Recognizing that there is foregone production due to training, profit maximzing firms may select communities with higher educational investment in order to reduce labor costs. A firm which locates in a community that has allocated greater investments to education is expected to obtain higher productivity, and the community is rewarded with increased economic opportunity.

Little research has been undertaken that relates local human capital investments through public education to changes in the local economy, changes in local demand for labor, or changes in the local demand for other public goods and services. The location and manufacturing studies to be mentioned below attempt to identify factors that influence local economic growth without presenting the theoretical basis for any influence that they might exhibit. The link between education as a form of human capital investment and industrial growth rests on the theory that human capital investment improves the quality of the labor force and thereby the value of the labor input to the production processes of the local economy (Welch). Clearly, the potential improvement accuring to management personal and the growth of entreprenueship may be additional benefits to be realized. Selecting variables to measure the effects of local human capital investment through public education, therefore, warrants serious atention.

Evidence of the level of human capital in a community's workforce can be measured by both stock measures and flow measures. Stock mea-

sures represent the level of education of the workforce after migration and other adjustments to the local labor force have occured. These measures represent the level of human capital stock retained in the community workforce given the characteristics of the local employment pool and prevailing wage rates. Stock measures also represent the quality and quantity of labor the firm may expect to be available when it begins operations in a community.

Flow measures, on the other hand, represent the current level of local investment in human capital being created through the public and private education systems. These measures indicate the level of human capital that the community is currently producing. They also provide an indication of the potential stock of human capital if individuals did not make further investments through migration to seek a competitive return for their human capital.

Luytjes's research on low income Kentucky communities found that increases in migration resulted from increased educational investment because of limited local opportunities for individuals to earn a return on their increased level of human capital. In another study conducted on people who migrated from Kentucky to seek employment, Deaton, Morgan and Anshel found a strong willingness of workers who had migrated from their home communities to return if job opportunities became available, due to the psychic cost associated with rural to urban migration. This indicates the importance of considering flow measures when evaluating local labor quality.

Relating education as a form of human capital to manufacturing employment growth, the stock measure provides insight into the current level of human capital supporting the community's economy. The flow measure, on the other hand, indicates the level of human capital that new industry could expect to find in the workforce after an initial lag period, if employment opportunities offering higher returns than existing jobs became available locally. Effective measures for both the stock and flow of human capital from public education is a necessary prerequisite for determining efficient allocation of public investments and of private sector location decisions. This would aid local decison makers in the allocation of resources across the range of local public services.

Section 2. Measures of Education in Community Growth Studies

Past research on local economic development has used manufacturing locations and employment changes as growth measures. The hypothesis that education investments influence industrial location decisions has been derived from the theory of spatial profit maximization in firm locations (Smith). Under this theory, footlose firms, i.e. site seeking, act to maximize profit through space by employing a two-stage search process. First, a firm defines a geographic region which optimizes location with respect to input fctors and product markets. The firm then picks a specific location within that region according to a least cost of production criteria.

A community's expenditures on education have been hypothesized to affect the cost structure of firms within this secondary site search level (Smith, Deaton and Kelch). The benefits cited as resulting from increased local educational expenditures are (1) a lower labor turnover, (2) a more trainable workforce, and (3) greater labor productivity. Educational attributes of a community are also hypothesized to influence firm managers' non-economic judgements in that (1) educational expenditures reflect the community's quality of life and (2) relocated managers and workers demand a certain level of educational and other public services for their family.

Table 1 summarizes the results of ten manufacturing location studies which employed variables describing the quality of the local work force. The estimated coefficients measuring the relationship of these variables to manufacturing growth are widely divergent. The signs of estimated regression coefficients were as hypothesized and significant in three studies (Kuehn, Braschler and Shonkwiler; Smith, Deaton and Kelch; Debertin, Pagoulatos and Smith) and significant with the wrong sign in one study (Leuck). Six studies found the variables to be insignificant.

An educational expenditure measure was used in three plant location studies which analyzed identical data sets from Kentucky and Tennessee, and varied only by model specification. Debertin, Pagoulatos and Smith, and Smith, Deaton and Kelch obtained positive significant results, while Smith and Klindt used dummy variables to describe regional differences

Table 1. Measures of Human Capital Investment and Their Role in Various Industrial Location Models (Number in parenthesis refers to author at bottom of page.)

Study Region	Model	Unit of Observation	Dependent Variable	Human Capital Proxy	Result
Missouri (1)	Linear Probability	Small Rural Towns	Plant Location	Distance to Tech.School	Negative (sig.)
Ky-Tenn (2)	Logit	Non-SMSA Towns	Plant Location	Educational Expenditures	Positive (sig.)
Ky-Tenn (3)	Linear Probability	Non-SMSA Towns	Plant Location	Educational Expenditures	Positive (sig.)
Ky-Tenn (4)	Linear Probability	Non-SMSA Towns	Plant Location	Educational Expenditures	not sig.
U.S. (5)	Ordinary Least Squares	SMSA's	Mfg.Emp. Growth	#Persons,Age 25, College Degree	+ or -, by Industry
Southern (6) U.S.	Ordinary Least Squares	Non-SMSA Cities	Pop. Growth	% Teenagers in School	not sig.
Ohio (7)	Ordinary Least Squares	Appalacian Counties	Mfg.Emp. Growth	Median School Years	Negative (sig.)
Southeast (8) U.S.	Ordinary Least Squares	Industrial Parks	Plant Location	Average Male Education	not sig.
N.Central (9) U.S.	Factor Analysis	Non-SMSA Cities	Change in # Plants	Health Expenditures	not sig.
Tennessee (10)	Factor Analysis	Non-SMSA Counties	Mfg.Emp. Growth	Education Expenditures	Negative (sig.)
				Health Expenditures	not sig.
				Welfare Expenditures	not sig.

(1) Kuehn, Braschler and Shonkwiler
(2) Debertin, Pagoulatos and Smith
(3) Smith, Deaton and Kelch
(4) Smith and Klindt
(5) Kaner
(6) Wheat
(7) Agthe and Billings
(8) Sulaiman and Husnak
(9) Dorf and Emerson
(10) Leuck

and found the variable to be negative and insignificant. In a study of employment changes, Leuck obtained negative significant results with this measure. Four studies used a proxy variable related to the level of local educational attainment (Kamer; Wheat; Sulaiman and Hushak; Agthe and Billings). The variable was significant with a negative sign in one study and non-significant in the other studies. Other measures related to labor quality include a health expenditure variable used in two studies (Dorf and Emerson; Leuck) and a welfare expenditure variable in one (Leuck). None of these variables was statistically significant.

The results from these studies provide no conclusions regarding the relationship of labor quality to industrial location. It is noteworthy that none of the above studies related their education variables to the concept of human capital. Indeed, with the wide variety of proxy variables used without precise theoretical underpinnings, conflicting results are not surprising. This literature does, however, hint at a relationship between education as an investment in human capital and economic development. This relationship will be developed more clearly in the next section of the paper.

The foregoing review of human capital theory gives us a framework within which we can reconsider the labor quality variables from Table 1. Of the two studies showing 'wrong' signs on the human capital proxy variables, one used a stock measure (median school years), while the other

had a flow measure (education expenditures). In the two studies which had 'correct' human capital signs, both used flow measures (education expenditures, distance to technical school). The five remaining studies found insignificant relationships, with flow measures used in two and stock measures used in three.

Section 3: An Operational Approach: Stock and Flow Measures for Education

Two measures of the current stock of human capital in a community's workforce have been used in the research cited above: 1) median years of schooling for the adult population, and 2) the percentage of the population older than twenty-five with a high school diploma. Both of these measure the level of formal schooling achieved by members of the local labor force, and appear to be effective proxies for measuring the current stock of human capital in the work force.

Identifying a flow measure for human capital investment is not as simple. Educational output, a measure for the human capital produced through investment in the school system, is not easily identified. Little concensus exists on what constitutes educational output, or on how to quantify it.

Per pupil expenditures and standardized achievement scores are two flow measures that have been used in prior research on education and seem to be reasonable proxies for human capital investment through public education. Expenditures on education have been used in estimating the demand for education and in some of the location and employment stu-

dies reviewed above. Achievement scores have been used in production of education studies (Coleman; Levin and Bowles; Perl). The achievement test score provides a measure for specific skills that schools are attempting to teach and are therefore believed to provide a better proxy for educational output. To determine the relationship between achievement test scores and expenditure figures, we examined the hypothesis that educational expenditures are positively related to school output in Virginia as measured by standardized achievement scores.

To do this, per capita personal income (PCI), per pupil school expenditures (PPE) and population (POP) were regressed on the standardized achievement scores for Virginia counties. Fourth grade achievement scores were used as the measure of educational output. Learning ability (LA4), reading (R4) and math (M4) achievement scores were each used as dependent variables in a regression model. Learning ablity (LA4) was used as an independent variables in equations with R4 and M4 as dependent variables since learning ability is expected to have a strong influence on the other two output measures. Cross-sectional data for 1979 for Virginia counties was used. The models were examined for heteroscedasticity by the Park-Glejser test, and for collinearity by examining the eigenvalues. No particular problems were revealed by these tests. Table 2 summarizes the models.

The results from model 1 reveal an inverse relationship between per pupil expenditures and learning ability. The other two variables, per capita income and population, had a direct relationship. The inverse

Table 2: Results of Virginia Education Research, 1983.

Model 1: Dependent Variable 4th Grade Learning Ability.

LA4 = 30.2492 + 0.0041 PCI - 0.0075 PPE + 0.0001 POP
(4.7186)* (0.0006)* (0.0035)* (0.0001)

Model was significant at the 0.0001 level, with R sq.= 0.476

Model 2: Dependent Variable 4th Grade Reading Score.

R4 = 12.2602 + 0.0011 PCI - 0.0085 PPE + 0.0001 POP + 0.9067 LA4
(3.9501) (0.0005)* (0.0025)* (0.0001) (0.0728)*

Model was significant at the 0.0001 level, with R sq.= 0.797

Model 3: Dependent Variable 4th Grade Math Score.

M4 = 6.9451 - 0.0001 PCI + 0.0006 PPE + 0.0001 POP + 0.8388 LA4
(5.1999) (0.0001) (0.0033) (0.0001) (0.0958)*

Model was significant at the 0.0001 level, with R sq.= 0.638

Standard errors are in parentheses; * = significance at 0.01 level. In all models n=90, with: PCI= per capita income
PPE= per pupil educational expenditure
POP= poulation

relationship of per pupil expenditures to learning ability leads us to reject the hypothesis that increases in per pupil expenditures will increase school output as measured by learning ability.

The second model provided a similar result for the per pupil expenditure variable. Again, it exhibited an inverse relationship to the school output measure while the other three variables had direct relationships. This result also leads us to reject the hypothesis that increasing per pupil expenditures for education will increase school output as measured by the reading standardized achievement scores.

In the third model, only the learning ability variable was significant. This result also leads us to reject the hypothesis that increasing per pupil expenditures for education will increase school output as measured by the math score.

More systematic research is needed to break school expenditures into specific expenditure categories in order to gain insight into the relationship between particular expenditure items and school output as measured by standardized test scores. However, the above analysis does indicate that increases in per pupil school expenditures does not necessarily mean that better education will result. Conversely, schools with higher per pupil expenditures are not necessarily schools with higher educational output as measured by standardized test scores.

This achievement test-expenditure analysis suggests that if the test score provides an appropriate flow measure for human capital, then per pupil expenditure, while a measure of public educational investment,

is not an appropriate proxy for the level of human capital achieved. The next section will present the results of a Virginia location model that uses an achievement test score as a flow measure for human capital and a ratio of high school graduates to adult population as a stock measure.

Section 4: An Industrial Location Model for Virginia

A critique of the research methods employed by the studies in Table 1 did not reveal any obvious merits of one approach over another. All of the studies were based on secondary data except for the two from Kentucky and Tennessee, which included some primary data. In an attempt to clarify the linkages of human capital investment to manufacturing growth, a logit model (similar to Debertin, Pagoulatos and Smith) was specified for Virginia localities. Stock and flow measures of human capital were employed, with the hypothesis that both would be positive influences in industrial location.

The model used a dichotomous dependent variable (1 = one or more new manufacturing plants, 0 = no new locations) to account for the 'success' of a community attracting a plant with at least 15 employees during the three year period 1979-81. The independent variables included location factors that were significant in the prior research cited in Table 1. All data were from secondary sources, except for the dependent variable and the existence of a development group variable, which were obtained from a recent mail survey. The human capital flow measure used was the 4th grade math score variable from above, while the stock mea-

sure was percentage of persons older than twenty-five with a high school diploma.

A summary of the model is presented in Table 3. The correct prediction rate (a substitute for R-square when 1-0 dependent variables are employed) was 80 percent. The full model was significant at the 0.0001 level. Only two variables, POP and DEVG, were significant at the 0.05 level, and each had the hypothesized sign. The two human capital variables were significant at the 0.15 level. Math scores had the hypothesized positive influence, while the effect of GRADS was not as hypothesized, and as such the results of this model are similar to the conflicting results found in other models.

There are several plausable reasons for the conflicting results of human capital variables in this and the previous studies of manufacturing employment growth. Schultz argued that human capital investment must always increase the productivity of labor, and the rate of return on these investments will always be positive. He recognized, however, that observed rates of return may be positive, zero or negative in the real world because of imperfect knowledge and uncertainty, and could result in estimation results contrary to expectations.

Costs of information to the firm may also provide an explanation of the conflicting results. That is, firms are limited in the resources they can devote to the site location process, as implied by Stigler's theory of search (Oster). As this theory is applied to firm location, the gains from search are found to increase with input levels, variance

Table 3. Independent Variables Used in Industrial Location Model, Virginia, 1979-1983.

Variable	Proxy	Specification	Logit Estimates
1. MATH4	Human Capital	Reading Test Results for 4th Grade, 1980	0.0445 * (0.0288)
2. GRADS	Human Capital	% Persons, Age 25, with High School	-0.0448 * (0.0280)
3. COL	Local Amenity	Distance to Nearest College	-0.0129 (0.0148)
4. POP	Size of Labor Force	Population 1980	0.0001 ** (0.0001)
5. EMPHRS	Agglomeration	Manufacturing Employment Hours	0.0001 (0.0001)
6. SMSAMI	Agglomeration	Miles to Center of SMSA	0.0175 (0.0136)
7. PCRACE	Discrimination	Percentage of Blacks	-0.0129 (0.0138)
8. DEVG	Site Marketing	Existence of Funded Development Group	0.9301 ** (0.4262)
9. EFFREAL	Firms' Costs	Effective Real Estate Tax, 1978	0.5795 (0.7633)
10. WAGE	Firms' Costs	Average Manufacturing Wages, 1978	0.0001 (0.0036)
11. FPR	Firms' Costs	Fire Protection Rating, 1978	0.1437 (0.1699)
12. INTERCEPT			-2.3267 (1.7448)

* = significant at .15, ** = significant at .05 (standard error), N = 136.
Model was significant at p=0.0001 level with correct prediction rate = 0.80.

of input costs and the covariance of cost distributions. Here, with education levels (as an input) being only one consideration among a myriad of location factors which have more predictable impacts on profits, it can be expected that firms will devote less attention to identifying pools of skilled labor, particularly if the cost of employing skilled labor has a small variance. This suggests that firms base their location decision more on labor costs than on education levels, and that they will have poor information regarding skill levels.

Another factor that could cause the conflicting results is aggregation of data. Manufacturing employment or firm location data are not dis-aggregated by SIC code in the estimated models. This aggregation may have grouped firms together that are actually seeking different labor skills and react differently to the local stock and flow of human capital. The small number of locations per industry make dis-aggregation impossible.

A recent study by Hekman points to another matter which may be related to the inconsistent results for the human capital proxy variables. That is, similar types of manufacturing firms exhibit varying demands for skilled labor inputs. In that study, 194 newly-located firms in the Southeast U.S. were asked to rate 19 location factors in order of importance. The firms represented 9 ten-digit SIC codes, and within those groups there were only three instances of strong importance of a skilled

labor supply. Within all of the other groups, skilled and unskilled labor supply showed about the same importance. For example, chemical firms rated unskilled labor supply as 15th in importance and simultaneously rated skilled labor supply as 14th. In other words, these firms need to draw on both skilled and unskilled labor from the local labor market. Clearly, a single measure of available human capital is inadequate for capturing the diverse range of skills that firms seek. More than one measure will probably have to be used to capture the diversity that firms seek, or else labor demand will have to be analized by firm type. It is interesting to note that Hekman's study inquired about the importance of local education, but included it under the heading 'quality of life factors'.

This paper has discussed four reasons why human capital variables may not reveal hypothesized relationships in association with manufacturing employment growth. They are: a) failure to distinguish between the stock and flow measures of education resulted in selection of inappropriate measures for these concepts; b) uncertainty and poor information about labor market conditions faced by firms; c) costs of search for location; and d) differing and diverse skill demands by industry, even among very similar firms. These issues point to conceptual problems that explain the inconsistency of prior research in this area.

BEST COPY AVAILABLE

Summary and Conclusions

Our review of past research that addresses the relationship between work force quality and local economic growth revealed a number of important shortcomings. First, practically every study has attempted to use either a direct or surrogate measure of locally available human capital with very little conceptual elaboration or justification. Second, the empirical results have been inconsistent and unstable. Alternative model specifications using the same data base were seen to change signs of the human capital coefficient. Third, no past research uncovered in our review distinguished between the stocks and flows of human capital.

This paper attempted to overcome those weaknesses by: a) conceptually classifying the concepts of human capital stocks and flows, b) statistically demonstrating the relationship between measures of human capital investments (as school expenditures) and human capital output (standardized achievement scores), and c) incorporating two conceptually defensible measures of human capital (a stock and flow measure) into a model of industrial location.

In the Virginia industrial location model the human capital flow measure gave positive results as hypothesized, while the stock measure had an unexpected negative influence. We do not see these results as a contradiction of the importance of human capital stock and flow. Rather, the difficulties presented by uncertainty and poor information, costs of search, and similar firms demanding different skill levels, are obfuscating the expected effects of human capital.

BEST COPY AVAILABLE

In future research, more attention should be given to establishing the proper conceptual framework linking local investments in schooling and other forms of increasing labor quality with different patterns of economic development. Most likely, a more refined delineation of industry by demand for human capital will be required in order to obtain parameter estimates that will serve to guide public policy, local decision making, and future research. This paper was designed to mark a first step in this direction.

REFERENCES

Agthe, Donald E., and Billings, R.Bruce. "The Importance of Community Economic Factors in the Success of Public Industrial Parks: A Case Study of the Southeast." Business and Economic Review, 24 (1977), 3-6.

Becker, Gary S. Human Capital. 2nd ed. Chicago: University of Chicago Press, 1975.

Blaug, Mark. "The Empirical Status of Human Capital Theory: A Slightly Jaundiced Survey". Journal of Economic Literature, 14 (1976), 827-55.

Coleman, James S. "Equity of Educational Opportunity: Reply to Bowles and Levin." Journal of Human Resources, 3 (1968), 236-246.

Deaton, Brady J., Morgan, Larry C., and Anschel, Kurt R. "The Influence of Psychic Costs on Rural-Urban Migration." American Journal of Agricultural Economics, 64 (1982), 177-87.

Debertin, David L. "Estimating Educational Production Functions in Rural and Urban Areas." Southern Journal of Agricultural Economics, 8 (1976), 31-6.

_____, Pagoulatos, Angelos, and Smith, Eldon D. "Estimating Linear Production Functions: A Comparison of Approaches". Southern Journal of Agricultural Economics, 12 (1980), 65-9.

Dorf, R.J. and Emerson, M. "Determinants of Manufacturing Plant Location for Nonmetropolitan Communities in the West North Central Region of the U.S." Journal of Regional Science, 18 (1978), 109-20.

Hines, Fred, Tweeten, Luther, and Redfern, Martin. "Social and Private Rates of Return to Investment in Schooling, by Race-Sex Groups and Regions." Journal of Human Resources, 5 (1970), 318-40.

Heikman, John S. "Survey of Location Decisions in the South." Federal Reserve Bank of Atlanta Economic Review, 6(1982), 6-19.

Holtmann, A. G. "A Note on Public Education and Spillovers Through Migration." Journal of Political Economy, 74 (1966), 524-25.

Kamer, Pearl M. "An Econometric Model to Evaluate the Competitive Position of U.S. Metropolitan Areas for Manufacturing Activity." Socio-economic Planning Sciences, 13 (1979), 227-34.

Kuehn, John A., Braschler, Curtis, and Shonkwiler, J. Scott. "Rural Industrialization and Community Action: New Plant Locations Among Missouri's Small Towns." Journal of The Community Development Society, 10 (1979), 95-107.

Leuck, D.J. "An Econometric Model of Manufacturing Growth in Rural Employment in Rural Tennessee Counties From 1962 to 1976." Southern Journal of Agriculture Economics, 11 (1979), 63-7.

Levin, H. M., and Bowles, S. "More on Multicollinearity and the Effectivness of Schools." Journal of Human Resources, 3 (1968), 393-400.

Link, Charles R., and Ratledge, Edward C. "Black-White Differences in Returns to Schooling." Review of Economics and Statistics, 57 (1975), 346-50.

Luytjes, Jan B. "Appalachian Brain Drain: Note on the Impact of Increased Educational Funds in Lagging Areas." Growth and Change, 2 (1971), 38-41.

Oster, S. "Industrial Search for New Locations: An Empirical Analysis." The Review of Economics and Statistics, 61 (1979), 288-92.

Perl, Lewis J. "Family Background, Secondary School Expenditure and Student Ability." Journal of Human Resources, 8 (1973), 156-80.

Poston, M. "The Theory of Spillovers and its Connection with Education." Journal of Public Finance, 21 (1966), 184-205.

Schultz, T.W. "Investment in Human Capital." American Economic Review, 51 (1961), 1-17.

Smith, David M. Industrial Location. New York: John Wiley and Sons, 1981.

Smith, Eldon D., Deaton, Brady J., and Kelch, David R. "Location Determinants of Manufacturing Industry in Rural Areas." Southern Journal of Agriculture Economics, 10 (1978), 23-32.

_____, and Klindt, Thomas H. Industrial Location and Growth in Sub-metro Tennessee and Kentucky Communities. Southern Cooperative Series Bulletin 258, June, 1981.

Sulaiman, Jamaluddin, and Husak, Leroy J. "The Impact of Industrial Sites on Industrial Employment Growth: A Case Study of Appalacian Ohio." The American Industrial Development Council Journal, 15 (1980), 7-22.

Welch, Finis. "Human Capital Theory: Education, Discrimination, and Life Cycles." American Economic Review, 65 (1975), 53-73.

Wheat, Leonard. Urban Growth in the Nonmetropolitan South. Lexington: Lexington Books, 1976.